## REMARKS

This amendment is filed in response to the final Office Action dated April 5, 2007. In that Action, Claims 1, 2, 5, 6, 8-10, 12, 14, 15-18, 27, 28, 31, 32, 34-36, 39, 41-45, 54, 58 and 60-62 were rejected under 35 U.S.C. §103(a) as being unpatentable over Johnson in view of Kita. Claim 37 was rejected under §103(a) as being unpatentable over Johnson in view of Kita and Schleifstein. Claims 3, 7, 19-22, 29, 33 and 46-49 were rejected under §103(a) as being unpatentable over Johnson in view of Kita and Smith. Claims 13, 40, 54-57 and 59 were rejected under §103(a) as being unpatentable over Johnson in view of Monette.

Applicant would like to thank the Examiner for his time and thoughtful consideration during the interview on May 31, 2007.

With regard to the §103(a) rejection based on Johnson in view of Kita, Applicant has noted in his previous response that Kita has nothing to do with nuclear resonant stimulation and there is no indication from either Kita or Johnson how the magnetic field source or microprocessor of Kita would be modified to carry out NMR or NQR. Kita only adjusts the magnetic field intensity (flux) and not any frequency, so the proposed combination of Johnson and Kita still fails to result in any adjustment which would affect a nuclear resonant stimulation source. Claims 1, 27 and 54 refer to adjustment of the "frequency of the nuclear resonance stimulation." Kita states that the "function of the microprocessor is … supplying the electromagnet with a proper level of electrical power," and that "the microprocessor increases the electrical power supplied to the electromagnetic device" (column 4, line 59 through column 5, line 3). The Office Action fails to explain why one skilled in the art would be motivated to adjust frequency (for nuclear resonant stimulation) based on prior art that only adjusts intensity (for polarization). The characterization of Kita at page 4 last paragraph through page 5 first paragraph of the Office Action never mentions the "frequency" of a nuclear resonance stimulation being adjusted. The Office Action concedes that Johnson does not teach the adjustment of the frequency based on sensed operating parameters, and the text at column 1, lines 54-56 of Johnson does not say anything about "varying" the frequency. The proposed combination of Johnson and Kita would thus result only in the Johnson device having an ability to adjust magnetic field intensity, and not frequency as claimed by Applicant. As stated in *In re*

*Kumar*, 418 F.3d 1361, 1369 (Fed. Cir. 2005), "To render a later invention unpatentable for obviousness, the prior art must enable a person of ordinary skill in the field to make and use the later invention." The proposed combination of Johnson and Kita does not *enable* Applicant's invention.

In the Advisory Action the Examiner noted that Johnson teaches different excitation frequencies corresponding to resonance frequencies for constituent elements, and compared this selection of an appropriate frequency to Applicant's claimed "adjusting" of the frequency of the nuclear resonance stimulation. However, the static selection of a completely different frequency for a different operational setup is not the same as "adjusting," and such a strained interpretation of Johnson ignores the plain meaning of that word. The term "adjust" does not refer to the selection of disparate values, but rather connotes only a small change from a previous setting. Indeed, the Latin root of "adjust" is the word *juxta* which means "near," and adjustment accordingly refers to a change in value which is still relatively close to the original value. This tenuous reading of Johnson further underscores the point that its combination with Kita does not result in Applicant's invention. Applicant's feedback apparatus does not select entirely different frequencies, but rather incrementally increases or decreases the current frequency setting for dynamic (real-time) optimization. This meaning is also inherent in the term "tune" which appears in Claims 12-14.

With regard to the §103(a) rejections based on Johnson in view of Monette, Applicant would reiterate that Monette fails to teach the adjustment of a nuclear resonance stimulation source. As with Kita, Monette says nothing about nuclear resonance (NMR or NQR). Monette's physical mechanism is polarization of the combustion materials, which is a completely different phenomenon from nuclear resonance. Polarization flips and oscillates the entire atom or molecule, but NMR and NQR do not flip the atom or even flip the nucleus. The nuclei in NMR/NQR are perturbed but not rotated 180 degrees, and the resulting nuclear motion is not oscillation but is precession (wobble). These differences in the physical mechanisms are crucial as they relate to how the instrumentation must be implemented.

Claim 13 depends from Claim 1, Claim 40 depends from Claim 27, and Claims 55-57 and 59 depend from Claim 54; Claims 1, 27 and 54 explicitly recite "nuclear resonance

stimulation" and the adjustment of the "frequency of the nuclear resonance stimulation." The Office Action incorrectly states that the Monette magnetic field "is capable of" stimulating the nucleus of an atom to nuclear resonance. The polarizing effect of Monette (and Kita) is not subatomic. The two opposing signals generated by the Monette device and emitted from two wires (reference numerals 8 and 9 of Monette) will not produce nuclear resonance. There is no targeting of any specific atoms but rather just a broad-brush attempt to polarize anything in the fuel line. The output signals of the Monette device do not fit with any definition of nuclear resonance. As stated in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. ___ (2007), quoting from *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." The Office Action lacks the explicit analysis required by *KSR*.

Moreover, the standard is not whether a prior art device is "capable of" achieving a particular result, and the question is not whether the device of Monette could be modified for use in NMR or NQR; instead, the question is what does Monette teach? One skilled in the art would not understand Monette to be applicable to nuclear resonant stimulation. There is nothing in either Johnson or Monette that would motivate one skilled in the art to apply Monette to nuclear resonant stimulation, and there is certainly no guidance on how it would be so applied. One skilled in the art simply would not think of taking the polarization technique of Monette and modifying it for nuclear resonance since the two techniques are fundamentally different. The differences between the techniques are also apparent from the lack of any electromagnetic pulse in either Kita or Monette. Claims 10, 17, 21, 36, 44 and 48 all recite synchronization of an electromagnetic pulse with the combustion reaction. In short, any ostensible feedback in Kita or Monette is based on a different science, performed in a different manner than claimed by Applicant, and is directed to a different result—polarization not nuclear resonance.

Furthermore, Monette does not provide any feedback adjustment of the frequency based on temperature in an exhaust stream. The Office Action incorrectly states that variations in the ambient temperature "obviously relate" to variations in the exhaust stream. This statement is conclusary and without scientific basis, and it is easily refuted by sticking a finger in an exhaust pipe of a car—whether the ambient temperature is hot or cold, the car exhaust is always

extremely hot. Feedback based on the temperature of an exhaust stream is simply not equivalent to feedback based on ambient temperature. Any correlation between exhaust temperature and ambient temperature is insignificant. It is not always desirable to have higher temperature combustion as there is a trade-off between combustion efficiency and undesirable gases such as nitrous oxides.

The differences between the ostensible frequency adjustments of Johnson, Kita or Monette and Applicant's invention may be further understood with reference to Applicant's Figure 4. The Examiner suggests that the selection of a particular frequency for a corresponding combustible constituent is tantamount to adjustment, but this step is merely the starting point for Applicant's invention. As seen in Figure 4, Applicant uses one input knob to enter the beginning frequency, but then further uses four other knobs to enter the frequency adjustment value, the maximum frequency, the minimum frequency, and the time slice. In the example of Figure 4, the beginning frequency was 3.0776 MHz but the current frequency, adjusted over time, has become 4.2330 MHz. None of Johnson, Kita or Monette provide this functionality, and all that those references teach is accomplished in the present invention via only the manual input for the first knob, i.e., the beginning frequency. The novel feedback feature of Applicant's invention takes place after, and in addition to, simply setting a single frequency. An ever-changing input frequency variation is required to obtain sustained NMR/NQR stimulation of the desired elements. Johnson clearly does not anticipate the requirement for changing resonant frequencies in order to compensate for changes in temperature, pressure or other combustion process parameters.

These differences may also be understood with reference to analogies using a light bulb and switch. Johnson's teachings would correspond to placing different light bulbs of different colors in a single socket, with only one light bulb in use at a time. Then an on/off switch is activated to turn on the light having a particular color. There is no adjustment of anything during the operation of that light bulb. If a different color is desired, the switch is turned off, and the bulb is replaced. Kita's teachings would correspond to using a single light bulb, but having a dimmer switch which adjusts only the brightness of the light bulb; the color never changes. Monette would allow a bulb to switch between the color red and the color blue, based on whether the outside temperature is hot or cold (and not based on anything going on inside the room).

Applicant's invention, in contrast, would allow the use of a single light bulb that automatically and continuously varies the color of the light (not its brightness) to achieve an optimum color based on relevant parameters.

Regarding Claim 54, Monette does not have any control logic that determines an operational adjustment factor. The ostensible control logic of Monette is identified in the Office Action as the microprocessor U1, but there is no explanation of how this microprocessor ever determines an operational adjustment factor, and indeed it does not. In the exemplary embodiment Applicant's invention can adjust the frequency, up or down, by an amount equal to ½ΔF, ΔF, or 2xΔF (see page 13, lines 4-21, and Applicant's Figure 3A). Monette provides no such choice in the determination of an adjustment factor.

With further regard to Claims 61 and 62, the Office Action concedes that Johnson does not disclose simultaneous multiple nuclear resonance stimulation, and refers to "duplication of parts." These claims do not involve mere duplication of parts and the effect is not simple amplification; rather, the claims recite two different frequencies (first and second) which are targeted for different selected components (first and second). Duplication of parts in this context would simply mean providing two stimulation sources for the same frequency. There is nothing in any prior art of record that discloses or suggests the simultaneous, multiple nuclear resonance stimulation of different selected components of a combustion reaction. The Advisory Action argues that Johnson suggests simultaneous, multiple frequencies referring to the teaching that different elements have different resonance frequencies, but Applicants would clarify that the text of Johnson never refers to the simultaneous production of multiple frequency inputs. Johnson throughout describes a single targeted frequency for any given embodiment; for example see the abstract which refers to "an oscillator" or other source at "a frequency", and "the nuclear resonance frequency."

Notwithstanding the foregoing, Applicant has amended Claims 1, 27 and 54 to clarify the active nature of the feedback loop in the present invention, by referring to "iteratively" sensing the operating parameters, and "automatically" adjusting the frequency "in real-time" based on the parameters. Applicant has further amended those claims to clarify that "adjusting" refers to selectively increasing or decreasing the frequency of the nuclear resonance stimulation by a

frequency adjustment value which is then used for a preset time as part of the same combustion process. No new matter has been added. The automatic feature is described extensively in Applicant's specification for example at page 11, lines 8-16, which note that the controller adjusts the frequency responsive to signals from the feedback unit. The automatic nature of the present invention is also contrasted with manual adjustment at page 13, lines 24-25, and at page 14, lines 22-24. The iterative checking of the feedback parameters is described at page 12, lines 19-26. The real-time adjustment of the frequency is mentioned at page 13, lines 18-19. Increasing or decreasing the frequency by the $\Delta F$ factor is discussed at page 13, lines 4-21, which is used until a preset time passes, e.g., 1 to 10 seconds, as mentioned at page 12, lines 21-26.

The claims as amended more closely comport with Applicant's description of a real-time, active (closed loop) software feedback control system for the purpose of dynamic and multiple operational input adjustments. These amendments accordingly further distinguish the present invention from the cited art. None of the references provide any sort of real-time feedback for NMR or NQR control, or adjust frequency incrementally using a frequency adjustment value or operational adjustment factor.

Applicants have made a diligent effort to advance the prosecution of this application by amending claims, deleting others, and pointing out with particularity how the claims as presented patentably define the invention over the prior art of record. In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the examiner is requested to telephone the undersigned.

Respectfully submitted,

/Jack V. Musgrove/

Jack V. Musgrove
Attorney for Applicant(s)
Reg. No. 31,986
Telephone: 512-689-6116